H. SOIL PREPARATION

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H. SOIL PREPARATION

PART I GENERAL

1.01 Description

Soil preparation is the process of preparing the soil by loosening and or tilling the soil and incorporating organic matter such as compost and fertilizers, minerals and other materials into soil to make it more friable, retain moisture and more fertile to support plant growth.

1.02 Definition of Contractor

The term Contractor is used in its broadest sense within this section. The Contractor may be a Developer/Contractor installing public improvements to be turned over to the County for maintenance, the County General Services Department, or Construction Contractors hired on contract by the County.

1.03 Scope of Work

A. The Contractor shall perform all soil preparation work including, but not limited to:

1. Topsoil placement.
2. Organic amendment.
3. Fertilizer placement.
4. Finish grading.
5. Soils Testing.

B. The work shall include the provision of all labor, materials, equipment and apparatus not specifically mentioned herein or noted on the Reviewed Landscape Plans, but which are incidental and necessary to complete the work specified.

C. Related work specified elsewhere.

1. Refer to the SUBMITTAL REQUIREMENTS section.
2. Refer to the IRRIGATION section.
3. Refer to the PLANTING section.
4. Refer to the LONG-TERM MAINTENANCE section.

H. SOIL PREPARATION

1.04 Quality Control

A. CODES AND STANDARDS

All construction shall comply with any applicable standards and current Federal, State and County codes and ordinances.

B. SAFETY

1. All work shall be performed in a safe manner and shall meet or exceed the safety standards established under the Federal Occupational Health and Safety Act (OSHA) and its most current amendments.

2. Barricades, guards, warning signs, and lights shall be erected and maintained as required by OSHA regulations, the Property Owner, or by the County for the protection of the public and workers.

C. PERSONNEL

1. The Contractor shall possess all proper and current licenses, certificates, permits and/or registrations required to perform the scope of services.

2. The Contractor shall employ at least one qualified supervisor familiar with the products and requirements of this section. The supervisor shall be present at the project at all times and his or her name shall be submitted to the County before beginning work. The supervisor shall be English speaking and shall have full authority to act on behalf of the Contractor.

3. The Contractor shall employ workers familiar with the products and requirements of this section.

D. SITE PROTECTION

A. The Contractor shall incur all expenses to repair or replace any damage to existing improvements, such as buildings, equipment, irrigation systems, piping, sewers, sidewalks, or landscaping caused during activities related to the scope of work in this section. Repairs and replacements must be done in a manner and to a quality level satisfactory to the Owner and County within a reasonable timeframe as determined by the County.

H. SOIL PREPARATION

B. The Contractor shall exercise extreme care when excavating and working near existing utilities. The Contractor is responsible for correcting any damage to existing utilities for which the Contractor's operation is either the direct or indirect cause. The Contractor is required to call Underground Service Alert (USA) at (800) 227-2600 or 811 for marking of underground utilities prior to excavating.

E. REVIEWS AND INSPECTIONS

See PLANTING section.
See SUBMITTAL REQUIREMENTS section

1.05 Submittals

The Contractor shall provide the soil analysis report and written certificates stating quantity, type, composition, weight, and origin for all amendments. Chemicals shall be approved by the County before the material is used on the site.

1.06 Soil Testing

A. The Contractor shall provide two one-quart samples to Waypoint Analytical of San Jose (408) 727-0330, or another County-recognized testing laboratory, for testing for conformance to this specification.

1. Sample one shall be from the proposed import topsoil
2. Sample two shall be from the proposed planting area.

B. For areas larger than 87,120 square feet (2 acres) , one additional sample shall be analyzed for each additional 43,560 (1 acre) square feet of landscaped area.

C. If the total length of the landscaped area, measured longitudinally, exceeds 2,500 linear feet (i.e. for median island strips or backing lot treatments), one representative composite sample shall be analyzed for each 2,500 linear foot segment.

D. For multiple, discontinuous landscaped areas within one project, one representative composite shall be analyzed for each distinct area, if the areas are separated by more than 2,500 feet.

E. If different soil textures or colors are discovered while sampling, a representative

H. SOIL PREPARATION

sample from each distinct soil type shall be analyzed.

F. One representative soil sample for every 3,000 cubic yards of import soil shall be analyzed.

G. Each composite sample shall be a mixture of 10 or more sub-samples taken from the rooting depths of the proposed plantings. Typical rooting depths are as follows:

1. Turf and herbaceous groundcovers: 0 to 6 inches
2. Shrubs: 0 to 18 inches
3. Trees: 0 to 12 inches and 13 to 36 inches (one sub-sample from each depth).

H. Each soil sample shall be analyzed to determine its soil chemistry for all of the following:

1. Alkalinity or acidity (pH)
2. Fertility
3. Landscape compatibility
4. Soil classification and particle size
5. Percolation or infiltration rate
6. Boron content
7. Percent organic matter
8. Soil texture
9. Salinity; including Electrical Conductivity (ECE) and Sodium Absorption Ratio (SAR)
10. Any calcareous or chlorosis conditions
11. Any other condition deemed important by the horticulturalist, or requested by the County.
12. Bay Friendly Landscape Guidelines recommendations

I. No material shall be delivered to the site until the County approves the material.

J. All testing costs shall be paid by the Contractor, including initial samples and any additional samples required due to non-compliance by the Contractor.

K. The results of the horticultural analysis shall be presented in a report that shall include recommendations for soil amendments, fertilization, drainage, drought-tolerant plant materials, and other necessary measures to assure a successful landscape design. The depth of the water table, if known, shall also be included in the report.

H. SOIL PREPARATION

L. The Contractor shall provide a one-quart sample of each proposed amendment to the testing laboratory for testing for conformance to this specification and recommendations for incorporation. No material shall be delivered to the site until the County approves the material. Amendment testing costs shall be paid by the Contractor.

M. For landscaped and hard-surfaced areas, the Contractor shall submit the pre-emergent herbicide information for approval by the County before any application.

N. In projects with multiple landscape installations (such as production housing developments) a soil sampling rate of 1 in 7 lots or approximately 15 percent will be adequate. Large landscape projects shall sample at a rate of equivalent to 1 in 7 lots.

O. If significant mass grading is planned, the soil analysis report shall be submitted to the local agency as part of the landscape documentation package or the soil analysis shall be submitted to the local agency as part of the certificate of completion.

P. The project applicant or his/her designee shall submit documentation verifying implementation of soil analysis report recommendations to the local agency with the Certificate of Completion.

PART 2 MATERIALS

2.01 Topsoil

A. A minimum 8-inch layer of clean topsoil shall be provided in all planting areas.

B. The topsoil shall consist of fertile, friable soil of a loamy character containing an amount of organic matter that is normal to the area before the addition of humus or soil amendments.

C. The topsoil shall be free of any refuse, heavy or stiff clay, hard dirt clods, stones larger than 1 ½ inches, roots larger than ¾ inch in diameter, litter, and other deleterious materials.

D. The topsoil shall be free of noxious weeds, Bermuda grass, nut grass, or other invasive wildland pest plant material, toxic amounts of boron, acid or alkaline chemicals, and shall be capable of sustaining healthy plant life.

E. Site strippings may be stockpiles and then used as topsoil, provided the material

conforms all applicable criteria.

F. Topsoil shall be a homogeneous mineral soil classified as sandy loam, or fine sand and meet the following requirements:

1. Particle size data shall be based upon standard USDA methodology.
2. Of the material falling in the sand category, a minimum of 80% shall fall in the fine sand range (.05 – 5mm).
3. Gravel content (greater than 2.0mm) shall be less than 15%.
4. Import topsoil shall not contain more silt and clay than the on-site native soil.
5. The sum of silt plus clay shall be less than 25%.
6. The soil shall be non-saline as determined on the saturation extract.
7. Salinity shall not exceed 3.0 mmhos/cm.
8. Boron shall not exceed 1.0 ppm and the sodium absorption ration (SAR) shall not exceed 6.0.
9. Soil reaction as determined on a saturated paste shall fall between 5.5 and 7.5.
10. Provisions shall be made to add required materials to the soil, as recommended by the testing laboratory in order to support normal plant growth.
11. The soil shall be free of organic herbicides or other growth restricting chemicals.
12. Contamination may be tested by greenhouse trials using rye grass and radish as test crops using the existing import soil as substrate. These trials require four to five weeks for completion.

2.02 Fertilizer

A. All fertilizers shall be commercially processed and shall conform to the requirements of the agricultural laws and regulations applicable in the State of California.

B. Unless otherwise specified, the fertilizer shall be a long-term, slow-release, water insoluble, nitrogen-based product.

C. The fertilizer shall be pellet, granular, or tablet form and shall have the chemical composition clearly marked on the packaging material for inspection by the County. The packaging must list the relative amounts of the three major macro-nutrients – Nitrogen (N), phosphorous (P), and potassium (K) – as percentages of the total weight. If other macro-nutrients (e.g. magnesium, sulfur, calcium) or micro-nutrients (e.g. chlorine, iron, boron, manganese) are included in a fertilizer, these must also be listed on the packaging. The fertilizer packaging must also indicate whether the product is "fast-release" or "slow-release".

D. Fertilizer shall be determined from soil analysis results, which shall be provided to the County.

2.03 Soil Amendments

A. The Contractor shall amend the topsoil in accordance with the recommendations of the soil report and as specified on the Reviewed Landscape Plans. If the Reviewed Landscape Plans are in conflict with the soil report, the report shall govern and the Contractor shall immediately notify the County of the discrepancy.

B. Nitrogen-treated organic amendments shall conform to:

1. Physical Properties
   a. 95% - 100% passing, sieve size 6.35mm (1/4 inch).
   b. 8-% - 100% passing, sieve size 2.38 mm.
   c. 0% - 30% passing, sieve size 500 micron.

2. Chemical Properties
   a. Nitrogen content dry weight basis – 0.4-0.6%.
   b. Iron content – minimum 0.08% dilute acid soluble Fe on dry weight basis.
   c. Soluble salts – maximum 3.5 millihos/centimeter @ 25 degrees C. as determined by saturation extract method.
   d. Ash – 0-6.0%.

C. Where such products are appropriate and available and, subject to County approval, the County encourages the use of recycled products as soil amendments. Recycled products may include composted yard debris, or rice hulls.

H. SOIL PREPARATION

When using recycled products, the Contractor shall provide certification that manufacturing procedures involve temperatures and detention times that effectively inactivate weed seeds and other deleterious organism or materials. The Contractor shall not violate any governing statute, such as Health Codes, in using these products.

D. Where such products are appropriate and available and, subject to County approval, the County encourages the use of organic compost as a soil amendment. Organic materials would be composed screened green waste from non-municipal sources, organic manures, organic grape pomace and organic rice hulls. The Contractor shall submit documentation to the County for approval.

E. The Contractor shall submit a certification describing the quantity, type, composition, weight, and origin of all amendments. Amendments shall not be delivered to the site without prior approval of the County.

2.04 Pre-emergent Herbicide

Unless otherwise specified on the Reviewed Landscape Plans, a broad-spectrum pre-emergent herbicide shall be used. The herbicide must be registered for use in the State of California. Care shall be taken in selecting the appropriate pre-emergent herbicide as the effectiveness of these products is determined by site-specific conditions.

PART 3 EXECUTION

3.01 Clearing and Grading

A. The Contractor shall complete the rough grading as necessary to round the top and toe of all slopes, providing naturalized contouring to integrate newly graded areas with the natural topography. Finish grading shall be completed in accordance with the information shown on the Reviewed Landscape Plans.

B. In all areas to be planted, remove and properly dispose all rocks and paving materials over 1 ½ inches in any dimension and all weeds, debris, and other deleterious or noxious material as described above.

3.02 Topsoil Preparation

A. If in-place soils are to be amended to create the topsoil layer, the in-place soils within the areas to be planted shall be cross-ripped and scarified to a minimum depth of 8 inches prior to the addition of amendments and fertilizers.

H. SOIL PREPARATION

B. If import soil is used for topsoil, the underlying sub-soil shall be cross-ripped and scarified to a minimum depth of 8 inches before topsoil is placed. The import soil shall then be incorporated and mixed with the sub-soil so that there is a gradual change from sub-soil to topsoil, rather than a sharp distinction.

C. Following the ripping and scarifying operation, all areas to be planted shall be tilled to break down clods, to expose deleterious material to be removed, and to incorporate soil amendments and/or commercial fertilizer. Amendments and fertilizers shall be evenly distributed and incorporated throughout the topsoil layer.

D. The tilling operation shall be performed until the ripped and scarified soil is in a loose condition and the amendments and fertilizers are thoroughly mixed.

E. The outer limits of the areas to be cultivated shall extend a minimum of 12 inches beyond the outer row of plants requiring cultivation, unless otherwise stated on the plans.

F. The use of rubber-tired equipment will be permitted for cultivating operations provided that the equipment used completely eradicates any compaction caused by the tires. Rubber-tired equipment will not be allowed on cultivated areas after cultivation.

G. Fine grading work shall not be performed when the moisture content of the soil is such that excessive compaction will occur, or when the soil is so dry that clods will not break readily or dust will form in the air. Apply water as required to prevent the formation of an airborne dust nuisance and to provide ideal soil moisture content for tilling. Landscape areas shall be compacted to 85% relative density.

3.03 Tree and Plant Pits

Refer to PLANTING section for soil preparation and amendment in plant pits.

3.04 Pre-emergent Herbicide

A. Pre-emergent herbicide shall be applied in accordance with the manufacturer's recommendations for all tree ring, ground cover, and shrub bed areas. The Contractor shall adhere to all agricultural laws and regulations applicable in the State of California and the manufacturer's safety recommendations when using agricultural chemicals.

H. SOIL PREPARATION

B. The pre-emergent herbicide shall be applied before mulch is placed.

C. The Contractor shall use care in applying pre-emergent herbicide to avoid damaging any existing trees or other landscape features scheduled to remain. Herbicide shall not be applied during windy conditions to avoid spray drift.

D. All employees using chemicals shall be trained in the proper use of these chemicals and shall be licensed or certified as required by state and local agencies.

3.05 Finish Grading

A. The Contractor shall finish grade all irrigated planting areas unless otherwise noted, and shall remove all rocks and clods over 1 ½ inches.

B. All areas shall be smooth and uniformly graded.

C. The Contractor shall repair all erosion damage during the construction period.

D. Unless otherwise noted on the Reviewed Landscape Plans, all soil finish grades shall be 1 inch below finish grade of walks, pavements, and curbs.

END OF SECTION

Approved by Special Districts

Signature _____

Date 4/24/2018

I. IRRIGATION SYSTEM

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I. IRRIGATION SYSTEM

PART 1 GENERAL

1.01 Description

A landscape irrigation system is any assemblage of special equipment and materials that is designed, manufactured, and installed for the controlled dispersion of water from any safe and suitable source. The landscape irrigation system has the express purpose of irrigating any types of landscape vegetation and providing any other environmental control of any landscaped areas.

1.02 Definition of Contractor

The term Contractor is used in its broadest sense within this section. The Contractor may be a Developer/Contractor installing public improvements to be turned over to the County for maintenance or Construction Contractors hired on contract by the County.

1.03 Scope of Work

A. It is the responsibility of the Contractor to complete the installation of the landscape irrigation system as indicated on the County Reviewed Landscape Plans. The Contractor is required to order and furnish all labor, materials, supplies, tools, and transportation, as well as perform all aspects of operations in connection with and reasonably incidental to the installation of the irrigation system. This work includes, but is not limited to, the following:

1. Automatic irrigation system; including piping, tubing, fittings, sprinkler heads, drip irrigation, couplings, adapters, and accessories
2. Pumps (if indicated on the Reviewed Landscape Plans)
3. Remote control valves, gate valves, quick coupler valves, master valves
4. Backflow preventer with enclosure and freeze blanket
5. Landscape water meter and or sub-meters (coordinate the installation to be done by others)
6. Flow sensors (if indicated on the Reviewed Landscape Plans)
7. Controller, controller wiring, mounting equipment and enclosure
8. Irrigation schedule
9. Irrigation audit report
10. Soil analysis (if not submitted with Landscape Document Package)
11. Testing
12. System adjustments
13. Excavation and backfill
14. Sleeving
15. Record or As-Built Plans including hydrozones
16. Certificate of completion
17. Provide a one-year warranty
18. Backflow inspection and testing

B. Work related to the landscape irrigation system that is necessary to complete the project according to the Reviewed Landscape Plans, may include:

1. Earthwork and site grading/sculpting
2. Concrete/bomanite installation
3. Planting
4. Electrical (power for the automatic irrigation controller)

C. Related work specified elsewhere.

1. Refer to the SUBMITTAL REQUIREMENTS section.
2. Refer to the PLANTING section.
3. Refer to the CENTRAL CONTROL IRRIGATION SYSTEMS section.
4. Refer to the LONG TERM MAINTENANCE section.

1.04 Quality Control

A. CODES AND STANDARDS

All work and materials shall be in full compliance with codes and standards, including, but not limited to:

1. The rules and regulations of the National Electric Code

2. The rules and regulations of the Uniform Plumbing Code, as published by the Western Plumbing Officials Association

3. All applicable State and local laws, codes, and regulations

4. Model Water Efficient Landscape Ordinance (MWELO), State of California.

The above-mentioned codes and standards are the minimum level requirements. Nothing in the Reviewed Landscape Plans is to be construed to permit work not conforming to these codes and standards. If the Reviewed Landscape Plans call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision in the Reviewed Landscape Plans shall take precedence. The Contractor is responsible for complying with all applicable rules and regulations, including those not mentioned here or shown on the Reviewed Landscape Plans. All materials and labor required for compliance shall be furnished by the Contractor, at no additional cost to the County.

B. SAFETY.

1. All work shall be performed in a safe manner and shall meet or exceed the safety standards established under the Federal Occupational Health and

Safety Act (OSHA) and its most current amendments.

2. Barricades, guards, warning signs, and lights shall be erected and maintained as required by OSHA regulations, the Property Owner, or by the County for the protection of the public and workers

C. PERSONNEL

1. The Contractor shall possess all proper and current licenses, certificates, permits and/or registrations required to perform the scope of services.

2. The Contractor shall employ at least one qualified supervisor familiar with the products and requirements of this section. The supervisor shall be present at the project at all times and his or her name shall be submitted to the County before beginning work. The supervisor shall be English speaking and shall have full authority to act on behalf of the Contractor.

3. The Contractor shall employ workers familiar with the products and requirements of this section.

D. SITE PROTECTION

1. The Contractor shall incur all expenses to repair or replace any damage to existing improvements, such as buildings, equipment, irrigation systems, piping, sewers sidewalks, or landscaping caused during activities related to the scope of work in this section. Repairs and replacements must be done in a manner and to a quality level satisfactory to the Owner and County within a reasonable timeframe as determined by the County.

2. The Contractor shall exercise extreme care when excavating and working near existing utilities. The Contractor is responsible for correcting any damage to existing utilities for which the Contractor's operation is either the direct or indirect cause. The Contractor is required to call Underground Service Alert (USA) at (800) 227-2600 or 811 for marking of underground utilities prior to excavating.

E. REVIEWS AND INSPECTIONS

The Contractor shall specifically request the following County reviews at the appropriate times and prior to progressing work. The County will decide at the time of the request whether the specific inspection will be required.

1. Mainline Pressure Test

Upon proper installation of the mainline, the Developer/Contractor shall contact the County, a minimum of three days in advance, to schedule a mainline pressure test. The mainline pressure test is always required.

2. Layout Inspection

   Prior to any installation, the exact locations of the major components of the landscape irrigation system shall be flagged and/or staked. This should include at a minimum the piping, sprinkler heads, valves, control wire, backflow prevention units, controllers, and weather stations. Once marked, the Contractor shall notify the County to schedule an inspection for approval of the layout of the project.

3. Substantial Completion Inspection

   a. This site visit is to be scheduled upon completion of all work and will review the entire site for conformance to the Reviewed Landscape Plans and these standards. The Contractor shall submit irrigation As-Built plans at this inspection for on-site review. A punch list documenting any deficiencies or items not in conformance will be distributed to the Developer/Contractor.

   b. A follow-up site visit will be conducted to verify that punch list items, or any other deficiencies that have occurred between inspections, have been corrected. If deficiencies remain, additional inspections will be required until all deficiencies are rectified. A punch list documenting any items not in conformance will be provided to the Developer/Contractor.

   c. The date the work passes the Substantial Completion Inspection shall be the start date of the required maintenance period, known as the Plant Establishment Period. In order to pass the Substantial Completion Inspection, the site must be per plan with the irrigation system functioning properly and all plant materials must be in a healthy, thriving condition. The County will provide written confirmation that the work has passed the Substantial Completion Inspection. This inspection is always required.

4. Final Acceptance Inspection

   a. This site visit is to be scheduled following completion of all punch list items and will verify that the project is complete and establish the date of final acceptance and assumption of maintenance by the County.

   b. All As-built plans and other materials/submittals detailed in this section shall be delivered prior to the final acceptance inspection, preferably at the start of the inspection.

   c. At this time all plant materials must be in a thriving, healthy and established condition, regardless of whether specifically noted on any punch list. Should it be determined that any deficiencies remain, the

County will terminate any further review of the site until all items are guaranteed, in writing, by the Developer/Contractor to be complete. If any plant materials are replaced, they must also become established and be in a healthy thriving condition, prior to scheduling a re-inspection. This inspection is always required.

d. The date the work passes the Final Acceptance Inspection shall be the start date of the required warranty period. However, if the work was installed as part of a Subdivision/Landscape Agreement, the start date of the required warranty period shall be the date of the Board Order in which the County Board of Supervisors declares the improvements as complete.

5. Warranty Inspection

a. This site visit is to be scheduled at the end of the required warranty period. The Developer/Contractor will be liable to make any necessary repairs or modifications of deficiencies resulting from faulty design, installation, labor, or materials. The Developer/Contractor will not be held liable for deficiencies resulting from improper maintenance actions, or neglect by the County.

b. The Developer/Contractor is not fully released from the work until the Warranty Inspection is passed. If the work was installed as part of a Subdivision/Landscape Agreement, release of the bonds will occur after the date of the Board Order in which the County Board of Supervisors declares the end of the warranty period for the improvements.

1.05 Submittals

A. MATERIALS

A list with information and descriptions of any components and materials to be used that are not specified on the Reviewed Landscape Plans shall be submitted to the County for approval. Information on acceptable products and materials can be found in "Part 2, MATERIALS AND PRODUCTS." All materials must be deemed acceptable by the County prior to any work being performed.

B. SUBSTITUTIONS

The County must approve any substitutions to the specifications of the Reviewed Landscape Plans and to the accepted list of materials. All substitutions must be of equal or greater quality than that specified. Requests for substitution must be accompanied by a copy of catalogue information on the materials desired for substitution. No substitutions will be permitted without prior written consent from the County. Unapproved substitutions shall be corrected for compliance at no

cost to the County.

C. RECORD OR AS-BUILT DRAWINGS

The Contractor shall maintain in the field office one complete set of the Reviewed Landscape Plans. Throughout installation of the landscape irrigation system, records shall be updated showing the exact locations of all the components of the system. If site conditions require modifications to the Reviewed Landscape Plans, the Contractor must first receive written authorization from the County. The Contractor shall then update the field-maintained Landscape Plans. Any work not installed as indicated on the Reviewed Landscape Plans that did not receive prior County approval constitutes and unauthorized change and shall be corrected by the Contractor at no cost to the County. The field-maintained Landscape Plans must also indicate the locations and dimensions of all underground electrical features, including stub-outs for future valves and connections. Locations on all As-Built Plans shall be made in reference to two permanent site features.

Upon completion of the project, the Contractor shall obtain reproducible prints from the Landscape Architect and neatly correct the prints to show all of the as-built conditions. The Contractor shall submit the As-Built Plans to the County, which must be done before the County will accept the project.

D. OPERATION AND MAINTENANCE MANUALS

Prior to the final inspection of the landscape irrigation system, the Contractor shall furnish two individually bound service manuals to the County. The manuals should contain the following:

1. An index sheet indicating the contact information of the Contractor. This includes at minimum the name, telephone number, and address.

2. A copy of the signed and completed Irrigation Warranty form.

3. A certificate of insurance verifying coverage for completed operations.

4. A list of equipment installed, with the manufacturer's contact information

5. Copies of installed equipment warranties and certificates.

6. Complete operating and maintenance instructions of all installed equipment. This should include the name of the manufacturer, the model number, exploded drawings, and a parts list.

   The contractor shall also provide the County with instructions for

operation of the landscape irrigation system as a whole.

E. HARDWARE ITEMS

Provide the County with the following hardware items:

1. Two sets of matching QCV (quick coupler valve) keys and hose swivels.
2. Two keys to each controller box.
3. Two sets of any special tool required for the maintenance of any component of the landscape irrigation system.

PART 2 MATERIALS

The Landscape Architect/Irrigation Designer shall design the landscape irrigation system in accordance with the following guidelines. The County shall reject landscape plans submitted for approval should materials and products specifications not meet the following criteria. Should site conditions dictate the need for materials or products not listed in the following, a written request by the Landscape Architect/Irrigation Designer shall accompany the Landscape Plans when submitted for approval.

2.01 Pipes and Fittings

A. PVC PIPE AND FITTINGS

1. Main lines under constant pressure shall be polyvinyl chloride (PVC) 1120-315 psi for diameters 2 inches and larger, and PVC 1120 Schedule 40 for diameters less than 2 inches.
2. At changes in direction or branch mains, use appropriate Schedule 40, Type I, Grade I PVC fittings as approved by the Uniform Plumbing Code.
3. Lateral lines not under constant pressure and protective sleeves shall be PVC 1120-Schedule 40 pipe with Schedule 40, Type I, Grade I PVC solvent weld fittings.
4. Connections between main lines and remote control valves (RCV's) shall be Schedule 80 PVC (threaded both ends) nipples and fittings.
5. Risers shall be Schedule 80 PVC threaded nipples and Schedule 80 PVC ells, as indicated on the Reviewed Landscape Plans.
6. Where non-potable water will be used for the irrigation system all piping and fittings shall be purple in color and clearly marked "Reclaimed Water Do Not Drink".

B. COPPER PIPE AND FITTINGS.

1. Copper pipe shall be Type K, hard tempered ASTM B88 and fittings shall be wrought solder joint type in accordance with ANSI B16.22.

2. Joints shall be soldered with silver solder, conforming to ASTM B206.

C. BRASS PIPE AND FITTINGS

1. Brass pipe shall be 85% red brass ANSI Schedule 40 screwed pipe.

2. Fittings shall be 125 pound class medium brass screw-type.

D. GALVANIZED STEEL PIPE AND FITTINGS

Galvanized steel pipe and fittings are generally NOT allowed. Should the use of galvanized steel pipe and fittings be necessary, prior written approval must be received from the County. However, underground installations will not be permitted under any circumstances

2.02 Backflow Prevention Units

A. Reduced Pressure Backflow Preventers shall be used, as manufactured by Zurn Wilkins, Cla-val, Febco, or an approved equal. The units shall be equipped with ball valves and the manufacturer and model number shall be specified on the Landscape Plans. The County will review the specification when the Landscape Plans are submitted for review.

B. Backflow prevention units shall be contained within a vandal-resistant enclosure. Specifications for enclosures are detailed in 2.16, Equipment Enclosures.

2.03 Pressure Vacuum Breaker Assembly

The County generally discourages the use of pressure vacuum breakers in favor of reduced pressure backflow prevention devices.

A. The pressure vacuum breaker assembly shall be Zurn Wilkins, Febco, or equal approved by the County. The manufacturer and model number of the assembly shall be specified on the Landscape Plans. The County will review the specification when the Landscape Plans are submitted for review.

B. Pressure vacuum breaker assemblies shall be contained within a vandal-resistant enclosure. Specifications for enclosures are detailed in 2.16, Equipment Enclosures.

2.04 Booster Pumps

A. The Landscape Architect/Irrigation Designer shall submit all manufacturer supplied data on all pumps. The manufacturer and model number shall be specified on the Landscape Plans. Booster pump information will be reviewed when the Landscape Plans are submitted for review.

B. All pumps shall have a flow-switch activation assembly and the proper motor size to ensure efficient operation.

C. All pumps shall be protected by a low-pressure inlet-sensing device.

D. All pipe and fittings within the pump assembly shall be made of brass.

E. All pumps shall be contained within a vandal-resistant enclosure to safeguard against vandalism and for sound attenuation purposes. Specifications for enclosures are detailed in 2.16, Equipment Enclosures.

F. Pump assemblies located adjacent to a wall shall be installed in a manner that provides clearance for servicing the assembly.

2.05 Master Valve and Flow Sensor

Central controlled irrigation systems shall include the appropriate master valves and flow sensors as listed on the Reviewed Landscape Plans. Master valves and flow sensors are required on all non-residential landscapes and residential landscape over 5,000 square feet, as listed on the Reviewed Landscape Plans.

2.06 Remote Control Valves

Remote control valves shall be globe patterned with a brass body and bonnet, brass flow stem, and a manual bleed petcock. Sizes of remote control valves shall be specified on the Landscape Plans and on the As-Built Plans. Remote control valves shall be Toro 220 series, Rainbird EFB-CP series, Griswold 2000 series, or an equal approved by the County.

2.07 Valve Boxes

A. Valve boxes shall be Carson model 1419 or an approved equal. A lid is required and both the box and lid shall be plastic. The lid shall be heat stamped with the controller designation and station number and be marked "IRRIGATION CONTROL VALVE" by the Contractor.

B. A 9-inch round plastic box shall be provided for gate valves and quick coupling valves. The Contractor shall provide extensions for the gate valves as required.

I. IRRIGATION SYSTEM

2.08 Automatic Irrigation Controller

A. CENTRAL CONTROLLED IRRIGATION SYSTEMS

Refer to the CENTRAL CONTROLLED IRRIGATION SYSTEM section for more detailed information.

County-maintained areas that are required to install a central controlled irrigation system controller shall conform to the following general requirements:

1. Automatic irrigation controllers for County-maintained irrigation systems shall be WeatherTRAK ET Pro 3 a dedicated mainline with the appropriate master valve(s) and flow sensor(s) shall be provided by the Contractor as listed on the Reviewed Landscape Plans.

B. NON-CENTRAL CONTROLLED SYSTEMS.

1. Automatic irrigation controllers for non-County maintained irrigation systems should be from the following list of manufacturers, or from an approved equal:

   a. Rain Master Eagle Series with Climate Logic
   b. Rain Bird ESP-LX Series with Climate Logic
   c. Irritrol MC-E Series with Climate Logic
   d. Hunter I CORE with Solar Sync

2. All controllers shall be a pedestal-mounted type for exterior installation and a wall-mounted type for interior installations. Contractor shall provide the appropriate conduit and wire and make connections to a 120 volt disconnect switch.

3. If a pump is required, the controller shall have an integral 120-volt pump starter relay.

4. All controller components shall be fused and the chassis shall be properly grounded per Article 250 of the National Electric Code and conform to all other applicable local codes and regulations.

5. Control wires shall be connected to irrigation controller in a sequential arrangement according to the assigned identification number of each valve as shown on the Reviewed Landscape Plans.

6. All controllers shall be equipped with a 4-inch X 4-inch electrical junction box, with an on/off switch, and a grounded duplex receptacle mounted inside the enclosure.

7. All controllers shall utilize evapotranspiration data utilizing non-volatile memory.

8. All non-residential systems shall utilize a master valve and flow sensor, all residential landscapes over 5,000 square feet shall utilize a master valve and flow sensor.

2.09 Automatic Irrigation Controller Wiring

A. The wiring for the irrigation controller shall be copper with UL approval for direct ground burial. The wire size shall be #14-1 single conductor.

B. The common ground wire shall have a white insulating jacket. The control wire shall have an insulating jacket of a color other than white.

C. Splices shall be made with 3M DBR/Y-6 splice kit or an approved equal. Splices shall be placed within a valve box. A separate ground wire is required for each controller.

D. Control wires shall be connected to irrigation controller in a sequential arrangement according to the assigned identification number of each valve as shown on the Reviewed Landscape Plans.

2.10 Moisture Sensors

The County does not allow the use of moisture sensors, in favor of other sensing devices such as a weather station linked to a central controlled systems, or ET based irrigation controllers.

2.11 Weather Stations

The Landscape Architect/Irrigation Designer shall contact the County prior to submitting any plans for review for information regarding new installation or connection to an existing weather station. In most instances, larger areas with multiple controllers will be required to install a new weather station specific to that project area.

2.12 Gate Valves

A. Gate valves 3 inches and smaller in size shall have bronze bodies and rising stems and brass cross handles. Gate valves of this size shall be threaded and manufactured by Nibco Class 125, T-113, or an approved equal.

B. Gate valves larger than 4 inches shall be AWWA approved and have flanged connections, a 2-inch square operating nut, cast iron bodies, and have an arrow cast in the metal indicating the direction of the water flow. Gate valves of this size shall be Nibco F-169, Stockham G-612, Kennedy 561X, or an approved equal.

I. IRRIGATION SYSTEM

2.13 Sprinkler Heads

A. LARGE TURF AND GROUNDCOVER SPRINKLER HEADS

1. For large turf and groundcover areas, sprinkler heads shall be gear-driven and pop-up type with integral check valve. The body shall be constructed with 3/4-inch or 1-inch N.P.T. bottom inlet. The sprinkler head shall have positive spring retraction and rise or pop-up a minimum of 4 inches for turf and 12 inches for groundcover. Acceptable manufacturers are Toro, Hunter, Rain Bird, or an approved equal.

2. The County does not allow the use of impact drive pop-up type sprinklers in favor of the above detailed gear-driven pop-up style sprinkler heads for water conservation reasons.

B. SMALL TURF AND GROUNDCOVER SPRINKLER HEADS

1. For small turf and groundcover areas, sprinkler heads shall be Toro 570ZPRX series or an approved equal with plastic Precision Series Rotating and/or Spray nozzles. A Toro Check-OMatic (COM) valve and pressure compensation device is required in all heads.

2. All heads shall rise or pop-up a minimum of 4 inches in turf areas, 12 inches in groundcover areas, and 12 inches in ares where the plants specified on the Landscape Plans may mature to block the water spray.

2.14 Drip Bubblers

A. Multi Outlet Drip Bubbler

1. Drip bubblers shall be Jain Octa-Bubbler or approved equal. The drip bubbler shall consist of a 8-outlet, pressure-compensating bubbler with 8 interchangeable flow rates ranging between 6-20 GPH, or any combination. The drip bubbler shall include a 1/2 inch FPT inlet with internal screen, liquid silicone pressure compensating diaphragm that delivers uniform water distribution over a wide range of operating pressure from 20 psi to 70 psi and a protective plastic housing. Drip bubblers shall be installed inside Agrifim emitter access box number EB6 or approved equal as shown in installation details. Jain HTP port plugs shall be installed on all open drip ports.

2. Polyethylene Drip Tubing shall be consistent with ASTM standards. The tubing shall be dimensionally accurate within published specifications. It shall meet or exceed all standards for physical characteristics, shall be environmentally stress-crack resistant, and sunlight resistant due to UV inhibitors. Drip tubing shall be Pepco P250 1/4 inch or approved equal. Tubing shall be buried minimum 6 inches from drip bubbler to

rootball of shrub as shown in details. At no time shall drip tubing be left exposed or on grade just under bark. Pepco bug plugs shall be installed at ends of all tubing.

3. Strainer for drip bubblers shall have bronze/plastic housing; 3/4 inch-l inch FIPT/MIPT connections with removable 150-155 mesh screen and integral flush valve with hose threads. Strainer shall be ¾-inch or 1-inch super as manufactured by Amiad Filtration or approved equal. Strainer shall be installed inside 14-inch X 17-inch valve box as shown in installation details.

4. Pressure regulator shall be diaphragm type, bronze construction with integral stainless steel strainer, pressure gauge and union. Pressure range shall be 0-50 psi and regulator shall be set to 30 psi. Pressure regulator shall be Zurn Wilkins model 900 or approved equal. Pressure regulator shall be installed inside 14-inch X 17-inch valve box as shown in installation details.

5. End flushing plugs are required at all ends of long drip bubbler runs or as shown on irrigation drawings. End flushing plugs shall be compression MHT ball valves or compression end caps as manufactured by Pepco or approved equal. End flushing plugs shall be installed inside 7-inch round valve box as shown in installation details.

B. Inline Emitter Sub-Surface Drip Tubing

1. Inline drip emitter sub-surface drip tubing shall be Hunter PLD-ESD or approved equal. The sub-surface drip tubing shall consist of polypropylene fleece wrapped sub-surface micro irrigation tubing consisting of fleece wrapped inline emitter tubing with 0.6 gallon per hour emitters with a 14-inch spacing. Emitters shall be pressure compensating with check valve capabilities. Tubing shall be installed per manufactures details, specifications and recommendations.

2. Inline drip emitter tubing shall be connected with Hunter PLD barbed insert fittings or approved equal. Tubing shall be buried minimum 6 inches below finish grade at no time shall drip tubing be left exposed or on grade just under bark. End flushing plugs are required on all ends of long sub-surface drip tubing runs or as shown on the irrigation drawings. End flushing plugs shall be barbed PLD-BV ball valves or PLD-CAP end cap as manufactured by Hunter Irrigation or approved equal. End flush plugs shall be installed inside 7-inch round valve box as shown in installation details.

3. Strainer for sub-surface tubing shall have bronze/plastic housing; 3/4 inch-l inch FIPT/MIPT connections with removable 150-155 mesh screen and integral flush valve with hose threads. Strainer shall be 3/4 inch or 1 inch super as manufactured by Amiad Filtration or approved equal. Strainer shall be installed inside 14-inch X 17-inch valve box as shown in installation details.

4. Pressure regulator shall be diaphragm type, bronze construction with integral

stainless steel strainer, pressure gauge and union. Pressure range shall be 0-50 psi and regulator shall be set to 30 psi. Pressure regulator shall be Zurn Wilkins model 900 or approved equal. Pressure regulator shall be installed inside 14-inch X 17-inch valve box as shown in installation details.

2.15 Quick Coupler Valves

A. Quick coupler valves shall be Rainbird 44LRC, Nelson 7643, Toro 474-03, or an approved equal.

2.16 Equipment Enclosures

A. All equipment enclosures for controllers, pumps, backflow preventers, and other miscellaneous equipment shall be vandal-resistant stainless steel and have stainless steel piano hinges. Stainless steel enclosures shall not be painted.

B. Equipment enclosures for automatic irrigation controllers:

1. Automatic irrigation controllers in areas to be maintained by the County shall be the Rain Master Evolution DX2 model and be supplied with the appropriate assembly enclosure.

2. Enclosures for automatic irrigation controllers in non-County maintained areas are required to have louvered vents covered by a brass or stainless-steel screen mounted inside the enclosure.

2.17 Miscellaneous Equipment

A. The Contractor shall provide and incur all costs for all equipment called for in the Reviewed Landscape Plans and as approved by the County.

2.18 Miscellaneous Installation Materials

A. The proper assembly of an irrigation system requires the use of other materials, including solvent cement, primer, joint sealer, Teflon tape, copper solder and flux, and wire connectors. All such products shall be used in strict accordance with the manufacturer's directions and recommendations.

1. Solvent cement and primer for solvent weld joints shall be of a make and type approved by the manufacturer of the pipe and fittings. The cement shall be maintained at the proper consistency throughout its use.

2. Lubricant for assembling rubber ring seal joints shall be of a make and type approved by the manufacturers of the pipe and fittings.

3. Pipe joint compound shall be non-hardening and non-toxic and designed for use on threaded connections in water carrying pipe. The joint compound shall be Lasco Blue Pipe Thread Sealant or an approved equal.

PART 3 EXECUTION

The following provides the guidelines the Contractor shall follow in the execution of the installation of the landscape irrigation system as set forth in the Reviewed Landscape Plans. The Contractor shall also refer to the DETAILS section and install all specified assemblies in accordance with the details shown therein.

3.01 General

A. The landscape irrigation system shall be installed by a licensed landscape contractor and shall be in full accordance with all applicable state and local laws, codes and standards.

B. The Contractor shall follow all manufacturer's directions and recommendations, unless otherwise indicated on the Reviewed Landscape Plans. However, in no instance shall this be construed as permission to violate any state or local law, code, or ordinance and nothing shall be done in a manner that nullifies a manufacturer's warranty.

3.02 Site Conditions

A. All scaled dimensions on the Reviewed Landscape Plans are to be considered approximate. The Contractor shall check the specifications list and verify all size dimensions prior to proceeding with any work.

B. Installation of all irrigation material and equipment, especially pipe, shall be coordinated in a manner that does not interfere with any utilities, future/other construction or lead to difficulty in planting trees, shrubs, turf or groundcover.

C. The Contractor shall avoid trenching within the dripline of trees whenever possible. When not possible, all damaged roots 1 1/2 inches and larger in diameter shall be cut leaving a clean face. Do not apply tree seal to cut root face; should the root be exposed for a significant period, the cut face shall be wrapped in wet burlap until the required irrigation components are to be installed, and the applicable trench section is to be back filled and soaked with water. However, no fittings shall be covered by such backfill until after the County inspection. The Contractor shall follow these actions immediately in order to safeguard the health of the tree.

D. All grades are to be checked carefully to ensure safety in the installation of the landscape irrigation system.

E. The Contractor shall coordinate any work to be done by others that affects the landscape irrigation system, such as the location of pipe sleeves through walls or under any paving.

F. The Contractor shall verify the available water pressure and flow rate prior to

construction. If deficiencies exist that will hinder the system's performance, the County is to be contacted immediately for direction.

G. The Drawing design is considered diagrammatic. All piping, valves, etc. shown within the paved areas are for design clarification only. All piping, valves, etc. are to be installed in planting areas only

3.03 Project Coordination

A. SEQUENCING AND SCHEDULING

The Contractor shall be aware of the full scope of the project. As such, the Contractor is responsible for the coordination of the installation of the landscape irrigation system with other site improvements, existing utilities and utility installations, plant materials installation, and any other work required for the completion of the project

B. ENVIRONMENTAL CONDITIONS

Site work such as trenching and backfilling shall not be performed during wet, muddy, or frozen conditions.

3.04 Protection of Improvements and Materials

A. The Contractor shall protect all work from damage for the duration of the contract. This includes work done by others. The Contractor shall also protect all materials as directed by the manufacturers. This includes protecting plastic pipe and fittings from direct sunlight, and from undue bending and external loading. The bed on which the pipe is stored is required to be the full length of the pipe. Any damaged pipe or fittings shall not be used under any circumstances.

B. The Contractor shall take all necessary precautions to protect all site conditions, improvements, and plant materials that are to remain. Should the Contractor cause any damage, the Contractor shall make repairs to restore to original condition or furnish and install equal replacements.

C. All existing irrigation systems shall be maintained in operating condition at all times. The Contractor is responsible for immediate repair of any damage to existing irrigation systems. Should repairs be made, the Contractor shall remove all sprinkler heads on applicable zones and flush the system of any dirt or debris before re-installing the sprinkler heads

3.05 Correction of Work

Any and all discrepancies of work the County deems unsatisfactory shall be corrected by the Contractor at no additional cost to the County. The correction of such work shall be completed within a reasonable time frame determined by the County.

3.06 Trenching

A. The trench shall be dug straight and in a manner that supports the pipe continuously on the bottom of the trench. The pipe shall be laid on an even grade. The trenching excavation shall follow the layout shown on the Reviewed Landscape Plans and which was field inspected and approved by the County.

B. Pressure supply lines shall be provided with a minimum of 18 inches of cover.

C. Non-pressure lines to spray sprinkler heads shall be provided with a minimum of 12 inches of cover.

D. All control wiring shall be provided with a minimum of 18 inches of cover.

E. Any pipe and/or wiring located under asphalt or concrete pavement shall be provided with a minimum of 36 inches of cover from finished grade, or be 12 inches below sub-grade, whichever is lower.

F. Trenches shall not be backfilled until all required tests and inspections are performed.

3.07 Installation and Testing of Main Line and Lateral Lines

A. MAIN LINE

The Contractor shall install the main line as indicated on the Reviewed Landscape Plans and in accordance with the manufacturer's directions and these Landscape Standards. Once installed, the Contractor shall adhere to the following steps required for testing before any further work is performed:

1. Install the main line, all fittings for connection to the lateral lines, and other components that join directly to the main line such as the backflow prevention unit, pressure vacuum breaker assembly, remote control valves gate valves, quick coupler valves, and booster pumps.

2. Contact the County a minimum of three working days in advance to schedule an appointment for a main line pressure test.

3. Cap all openings in the line.

4. Place small sections of backfill over the line to prevent slipping, arching, or other movement when the line is under pressure. No fittings shall be covered by such backfill.

5. Testing of pressure main lines shall be done prior to the installation of electric control valves.

6. During County inspection and testing, the Contractor shall perform ASTM F-690 testing as follows:

   a. Solvent welded PVC joints shall have cured a minimum of four hours or longer if required by manufacturer's directions. The Contractor shall adhere to all other manufacturer's directions.

   b. Slowly fill the pipe with water to avoid water hammer damage.

   c. Bleed the line to remove all air from the pipe.

   d. Using a hydraulic pump or other safe method (do not use an air compressor), pressurize the line to 125% of the designed operating pressure.

   e. After two hours of maintaining the above pressure, the line will then be inspected for leaks or other problems while the system continues to hold the above pressure.

   f. The Contractor shall be responsible for correcting any inadequacies, deviations from the Reviewed Landscape Plans, or any other problems found by the County. Corrections will be made at no cost to the County. Any faulty joint shall be completely rebuilt. The use of any cement or caulking to seal a leak is strictly prohibited. After all corrections are made, the Contractor shall again notify the County to schedule an appointment for a re-inspection.

   g. The Contractor may proceed with installation of the lateral lines only after the main line passes inspection.

7. Install 3-inch wide non-detectable marking tape 12- to 18-inches below the surface and a minimum of 12-inches above lines and irrigation wires to be protected. For potable mainlines, tape shall be blue non-detectable marking tape (model TA-NC-3-BW). For non-potable mainlines, tape shall be blue non-detectable marking tape (model TA-ND-3-BI). For recycled water mainlines, tape shall be purple non-detectable marking tape (model TA-ND-3-PBI). All tape shall be manufactured by T. Christy Enterprises, Inc. (800) 258-4583, or equivalent as approved by the County.

B. LATERAL LINES

The lateral lines shall only be installed after the main line has passed inspection and testing:

1. Lateral lines shall be installed in a manner that will not damage the main line.

2. The pipe shall be filled with water slowly to avoid water hammer damage.

3. The system shall be visually inspected for leaks at normal line pressure after installation is complete. Any faulty joint shall be completely rebuilt. The use of any cement or caulking to seal a leak is strictly prohibited. Make any needed corrections prior to scheduling the system inspection with the County.

3.08 PVC Pipe and Fitting Installation and Connections

A. Multiple assemblies shall not be installed on plastic lines or lateral lines. Each assembly shall be provided with its own outlet.

B. PVC pipe and fittings shall be thoroughly cleaned to remove any dirt dust moisture or other foreign matter before installation.

C. SOLVENT WELDING

PVC pipe and fittings are to be joined using solvent welding. This method is to be performed in accordance with the indications supplied by the primer, solvent cement, pipe, and fitting manufacturers. Generally, the method is as follows:

1. The joint is to be made by first squaring and deburring the end of the pipe. The pipe is to then be cleaned again to remove any dirt, dust, moisture, or other foreign matter.

2. Dry fit the pipe to ensure it inserts 1/3 to 2/3 of the depth of the socket.

3. To join the pipe with the fitting, first coat both the outside (male end) of the pipe and the inside (female) part of the fitting socket with an approved primer, such as Weld-On P-70 Primer. Without delay, apply an approved solvent cement, such as Weld-On 711 Cement liberally to the male end of the pipe. Also, apply a light coating of cement to the female part of the fitting socket, followed by a second coating to the male end of the pipe.

4. Immediately insert the pipe into the fitting and turn the pipe 1/4 turn to properly seat the pipe, distribute the cement evenly, and remove any air bubbles. The pipe must seat to the bottom of the socket and be aligned properly to avoid undue strain to either the pipe or the fitting.

5. The joint should be held still and in place for a minimum of 30 seconds.

6. Wipe any excess cement from the pipe and fitting.

7. Allow the joint to cure for a minimum of 30 minutes before handling and a minimum of 4 hours before allowing water into the pipe.

D. THREADED JOINTS

Where threaded joints are to be used, such as the riser connector to the sprinkler head, the Contractor shall adhere to the following:

1. Only factory formed threads are permitted. Field threading of plastic pipe will not be permitted under any circumstance.

2. All threaded plastic joints shall be treated with threaded joint sealant compound. The compound must be approved by the County for use on plastic pipe. The compound should be applied to the male end of the pipe only. Adhere to all applicable manufacturers' directions.

3. Align and tighten the pipe and fittings to properly engage threads. Caution must be exercised to not strip the threads.

4. Final tightening of the threaded joint shall be done with a strap-type wrench. Under no circumstance shall wrenches with metal jaws be used on plastic pipe and fittings. Do not over-tighten and strip the threads. Wrench tightening shall not rotate the joint more than one full turn beyond that of hand tightening.

E. During assembly and installation of the pipe and fittings, all openings shall be capped to prevent dirt or other debris from entering the assembly creating an obstruction and reduced system performance. Caps and plugs shall only be removed when necessary to continue assembly.

F. PVC pipe shall be installed in the trench with moderate "snaking" from side to side to allow for expansion and contraction. The pipe shall not be installed when the air temperature is below 40° Fahrenheit.

3.09 Copper Pipe and Fitting Installation and Connections

A. SOLDERING

Copper pipe and fittings shall be joined using silver solder conforming to ASTM B206. All directions by the pipe, fitting flux, and solder manufacturers shall be followed. Generally soldering is as follows:

1. Copper is a soft metal and caution shall be exercised to not pinch or crimp the pipe or the fittings.

2. The pipe end shall be cut square using a wheel-type cutter. Do not apply excessive pressure that may damage the pipe. Cutters of other types are not permitted.

3. The pipe and fittings should first be cleaned to remove dirt dust, moisture or other foreign matter before beginning.

4. The fresh cut on the male end shall have any burrs or other extraneous materials removed.

5. The male end of the pipe and the female fitting socket shall be cleaned/polished with an emery cloth to remove any oxidation or residuals that can hinder the soldering process.

6. Wipe the polished areas with a clean cloth and take care to not touch these areas with bare hands as the oils in the hand can also inhibit the soldering process.

7. Apply flux to the male end of the pipe and the female fitting socket. Be sure to follow the manufacturer's directions. Application of flux is required as it helps the solder to be drawn into and bond the joint properly.

8. The pipe should be firmly inserted into the fitting and given a 1/4 turn.

9. Using the appropriate type of torch, the joint should be heated uniformly. Proper temperature is achieved when the solder is put into contact with the joint and the solder melts and is drawn into the joint forming an even bead along the outer edge of the joint.

10. Once cooled the joint is to be wiped clean and inspected to ensure proper solder fill and bonding.

11. The joint shall be allowed to cool completely before being handled and permitted to have water in the line. Do not attempt to aid the cooling process, as this will deteriorate the quality of the joint.

B. THREADED JOINTS

Should the County grant permission for the use of threaded joints in copper pipe and fitting assemblies, the Contractor shall adhere to the following:

1. All connections to threaded fittings shall be done using factory produced adapters only. Copper pipe may be field threaded only when absolutely necessary. Field threading shall be done accurately on the proper axis and done utilizing a sharp die. Any adapters are to be soldered to the nonthreaded end of the assemblies (refer to above section on soldering).

2. All threaded copper joints shall be treated with threaded joint sealant compound. The compound must be approved by the County for use on copper pipe. The compound should be applied to the male end of the pipe only. Adhere to all applicable manufacturers' directions.

3. Align and tighten the pipe and fittings to properly engage the threads. Caution must be exercised to not strip the threads.

4. Final tightening of the threaded joint shall be done with a strap-type wrench. Under no circumstance shall wrenches with metal jaws be used on copper pipe and fittings. Do not over-tighten and strip the threads. Wrench tightening shall not rotate the joint more than one full turn beyond that of hand tightening.

C. During assembly and installation of the pipe and fittings, all openings shall be capped to prevent dirt or other debris from entering the assembly creating an obstruction and reduced system performance. Caps and plugs shall only be removed when necessary to continue assembly.

3.10 Brass and Galvanized Steel Pipe and Fitting Installation and Connections

The County does not generally permit the use of galvanized steel pipe and fittings. When permitted for use, both brass and galvanized steel joints are to be connected using threaded screw joints. The method for connecting threaded joints is as follows:

A. Field threading should be done only when absolutely necessary. Field threading shall be done accurately on the proper axis and done utilizing a sharp die.

B. All threaded joints shall be treated with threaded joint sealant compound. The compound must be approved by the County for use on the appropriate pipe. The compound should be applied to the male end of the pipe only. Adhere to all applicable manufacturers' directions.

C. Align and tighten the pipe and fittings to properly engage the threads. Caution must be exercised to not strip the threads.

D. Final tightening of brass threaded joints shall be done with a strap-type wrench. Under no circumstance shall wrenches with metal jaws be used on brass pipe and fittings. Metal jaw wrenches are permitted for use on galvanized steel pipe and fittings only. Do not over-tighten and strip the threads. Wrench tightening shall not rotate the joint more than one full turn beyond that of hand tightening.

E. During assembly and installation of the pipe and fittings, all openings shall be capped to prevent dirt or other debris from entering the assembly creating an obstruction and reduced perfom1ance. Caps and plugs shall only be removed when necessary to continue assembly.

3.11 Rubber Ring Seal Joint

When approved for use by the County, rubber or gasket seal joints should be assembled according to the manufacturer's directions. Thrust blocking shall be provided with the use of rubber ring seal joints.

A. RUBBER RING SEAL JOINT

1. Factory produced male ends should be used whenever possible. All male ends made in the field shall match exact factory specifications.

2. Carefully clean the bell or coupling to remove any dirt, dust, moisture, or other foreign matter. Proper cleaning is necessary to ensure a proper seal.

3. Carefully insert and position the ring seal or gasket without applying lubricant following the directions of the manufacturer.

4. Lubricate the male end according to manufacturer's directions. Insert the male end as specified to the required depth. When inserting PVC pipe, do so by hand only and not with the aid of any tools.

5. Complete the joint with the installation of the proper coupling.

B. THRUST BLOCKS

1. Thrust blocks shall be provided at every change of direction in the main line pipe and at every in-line valve to resist system pressure force.

2. Thrust blocks shall be concrete with the size determined by a soil safe bearing of a 700 pounds per square foot load and in accordance with the manufacturer's minimum recommendations to withstand the maximum surge pressure against the soil type in which it is installed.

3. Thrust blocks shall be placed upon solid undisturbed soil under the fittings.

4. Thrust blocks shall come in contact with the soil and fittings only. Contact with the pipe shall be avoided.

3.12 Backflow Prevention Units

The backflow prevention unit shall be carefully installed according to the manufacturer's directions between the water source and the irrigation system main line. Placement of the backflow prevention unit shall leave adequate spacing for the installation of an enclosure, to allow easy access for maintenance purposes, and screened by landscape planting. The unit will be

inspected by the County as part of the main line test and inspection.

3.13 Pressure Vacuum Breaker Assembly

The pressure vacuum breaker assembly shall be installed according to the manufacturer's directions and will be inspected by the County as part of the main line test and inspection.

3.14 Booster Pump

If a booster pump is required to increase the existing pressure, the booster pump shall be installed on the main line according to the manufacturer's directions and will be inspected by the County as part of the main line test and inspection.

3.15 Master Valve and Flow Sensor

Central controlled irrigation systems shall include the appropriate master valve(s) and flow sensor(s) or combination units, as determined through consultation with HydroPoint Units shall be installed in accordance with manufacturer's directions. Reference shall be made to the "Master Valve and Flow Sensor Detail," listed in the DETAILS section.

3.16 Remote Control Valves and Valve Boxes

A. Remote control valves shall be installed as indicated on the Reviewed Landscape Plans and grouped together whenever practical.

B. Remote control valves shall be properly placed and with adequate spacing as follows:

1. Valve boxes shall be provided for all remote control valves. Each valve box shall contain only one remote control valve, without exception.

2. Locate valve boxes 12 inches away from and perpendicular to walkway edges, buildings and walls.

3. Locate grouped valve boxes 12 inches apart and align the sides parallel to each other.

4. All valve boxes located near turf areas shall be located outside of play areas.

5. Whenever possible, all valve boxes shall be located in shrub/groundcover areas.

6. All valve boxes shall be heat stamped with the controller and station designation and be marked "IRRIGATION CONTROL VALVE."

7. All remote control valves are to have a separate ball valve and union installed before the valve.

C. After passing the main line pressure test, thoroughly flush the main line before installing any valves.

3.17 Automatic Irrigation Controller Wiring

A. CENTRAL CONTROLLED IRRIGATION SYSTEMS

Reference shall be made to the CENTRAL CONTROLLED IRRIGATION SYSTEM section for more information. Additionally, the Contractor shall conform to all applicable automatic irrigation controller wiring guidelines detailed for non-central controlled systems.

B. NON-CENTRAL CONTROLLED IRRIGATION SYSTEMS

1. When possible, the automatic controller wiring shall follow the same route as the pressure supply or lateral lines and it shall be located within the same trench. When not possible, the automatic controller wiring shall be housed in PVC conduit, as described in section 3.18, Sleeves and Conduits.

2. If more than one wire is to occupy the same trench, the wires shall be taped together or tied with cable ties at l0-foot intervals.

3. Expansion coils shall be provided. Expansion coils shall be formed by wrapping the required length around a 2-inch diameter pipe and then withdrawing the pipe. Requirements for expansion coils are as follows:

   a. Provide a 3 foot expansion coil at each point of wire connection.

   b. For wire runs greater than 100 feet in length, a 3-foot expansion coil shall be provided at each interval of 100 feet.

4. Splicing is only permitted on runs exceeding 2,500 feet. All splices shall be placed inside junction boxes with their exact locations shown on the As-Built Plans.

5. Connections shall be made by crimping the bare wire over a brass connector and sealing the connection with an epoxy resin sealer pack.

6. One spare wire of a color other than white shall be installed along the entire length of the mainline, running from the valve boxes to the automatic

controller, for every 12 remote control valves. A minimum of 1 spare wire shall be installed if the project has fewer than 12 valves.

7. At each valve and at the automatic irrigation controller the automatic irrigation controller wiring shall be labeled with a 2 1/4-inch X 2 3/4-inch polyurethane identification tag. The identification tag shall indicate the controller number and that valve's station number. The identification tag shall be attached to the controller wire.

3.18 Sleeves and Conduits

A. Sleeves and conduits are required under any of the following conditions:

1. For all flow sensor cables of a central controlled irrigation system.

2. When the automatic irrigation controller wiring is not located in the same trench and along the same route as a pressure supply or lateral line.

3. When the automatic irrigation controller wiring passes under an area that is to be paved with concrete or asphalt.

4. For any exposed automatic irrigation controller wiring that will not be sheltered by any other means.

B. All sleeves and conduits shall meet the following requirements:

1. All underground sleeves and conduits shall be Schedule 40 PVC pipe and of a size that comfortably accommodates the wiring it is to house.

2. Flow sensor cables of a central controlled irrigation system shall be run in 1-inch Schedule 40 PVC from the flow sensor to the automatic irrigation controller enclosure.

3. Underground sleeves and conduits shall extend a minimum of 12 inches beyond the edge of paved areas and curbs.

4. Sleeve and conduit openings shall be provided with removable non-decaying plugs to prevent the entrance of earth and other debris.

3.19 Weather Stations

Weather stations shall be installed in accordance with the manufacturer's directions. Connections shall also be done in accordance with the manufacturer's directions.

I. IRRIGATION SYSTEM

3.20 Automatic Irrigation Controller

Automatic irrigation controllers shall be installed as indicated on the Reviewed Landscape Plans. The exact location for mounting the controller will be determined by the County at the site.

A. The Contractor shall provide and install any additional equipment, materials, and labor needed for the installation and connection of the automatic irrigation controller, which may include electrical outlets, wiring, conduits, and sleeves.

B. The automatic irrigation controller shall be connected to a 120-volt disconnect switch and outlet that is located reasonably nearby for ease of maintenance.

C. The control wires shall be connected to the automatic irrigation controller in a sequential arrangement according to the assigned identification number of each valve as shown on the Reviewed Landscape Plans.

D. Reference shall also be made to the CENTRAL CONTROLLED IRRIGATION SYSTEM section.

3.21 Gate Valves

Gate valves shall be installed as indicated on the Reviewed Landscape Plans. Gate valves shall be installed according to the manufacturer's directions.

3.22 Sprinkler Heads

A. Sprinkler heads shall be located as indicated on the Reviewed Landscape Plans.

B. The line shall be thoroughly flushed before installing any sprinkler heads or quick coupler valves.

C. All manufacturer directions for installation shall be followed.

3.23 Equipment Enclosures

All equipment enclosures shall be installed according to the manufacturer's directions. Refer to the CENTRAL CONTROLLED IRRIGATION SYSTEMS section for information on satellite assemblies.

3.24 Adjustments and Corrections to the Irrigation System

The following adjustments shall be made in preparation for testing and to ensure optimum performance of the landscape irrigation system:

A. All sprinkler heads shall be flushed and cleaned. Disassembly of the sprinkler head may

be necessary.

B. Sprinkler heads shall be adjusted for proper distribution, direction, and trim to eliminate over-spray or runoff onto walkways, roadways, buildings, and other areas not intended for irrigation during normal operation. Repeat cycles shall be programmed if the problems cannot be corrected with other adjustments.

C. The Contractor shall determine if coverage is adequate and shall inspect the system and notify the County if any changes are required for proper coverage, such as changes in nozzle size or degrees of arc of sprinkler heads. All changes must be approved by the County and noted by the Contractor on the As-Built Plans.

D. With the system under pressure, all joints shall be visually inspected for leaks. Any faulty joint shall be completely rebuilt. The use of any cement or caulking to seal a leak is strictly prohibited.

E. Upon completion the irrigation controller shall be adjusted to provide the minimal amount of water required to sustain healthy plant growth based on local and historical E.T. data. At no time shall a valve be programmed so that the precipitation rate of the sprinklers exceeds the infiltration rate of the soil causing excessive ponding or run-off.

3.25 Backfilling

Backfilling shall not be done until all required tests are performed and the County grants approval to backfill. The following are the requirements for backfilling:

A. In sensitive areas such as at bends or in rocky terrain, pipe shall be surrounded with sand. Provide a 4-inch bed of sand and cover the pipe with 4 inches of sand.

B. Backfill in areas that are to be paved shall provide pipe with a 6-inch cover and a 4-inch bed of sand.

C. The remaining backfill is to be of approved excavated material consisting of earth, loam, sandy clay, and sand. The backfill shall not contain any large clods, stones, or debris.

D. The backfill shall be mechanically compacted to a dry density equal to that of the surrounding undisturbed soil.

E. The backfill shall conform to the adjacent grades, without having any dips, humps, sunken areas, or other surface irregularities. The final grade shall be as specified on the Reviewed Landscape Plans.

3.26 Site Cleanup

A. The site shall be maintained in a clean condition as work progresses. Refuse and excess

dirt shall be removed from the site and disposed of properly at the Contractor's expense. All walks and other paved surfaces shall be swept and/or washed. The site shall be inspected for any damage caused either directly or indirectly by the Contractor. Any damage shall be restored to original condition as indicated under 3.04, Protection of Improvements and Materials.

B. After the installation of the landscape irrigation system and at other times as directed by the County, the Contractor shall remove all trash, debris, surplus material, and unneeded equipment from the site. The site shall be maintained in an orderly fashion at all times.

3.27 Warranty

A. For those areas to be maintained by the County, the Contractor shall provide the County with a signed guarantee prior to the County accepting the project. The warranty requires the Contractor to make any necessary corrections to the landscape irrigation system at the Contractors expense for a period of one year from the date of acceptance by the County. The Contractor shall make corrections within 10 days of notification by the County.

B. The Contractor shall guarantee all materials, equipment, and workmanship to be free of defects and to fill and repair all depressions due to the settlement of trenched areas and to repair or replace any lawn, plants, or other improvements disturbed by the problem or during repairs. Ordinary wear and tear, unusual abuse or neglect is exempted.

C. Refer to the Irrigation Warranty Detail for more information.

END OF SECTION

Approved by Special Districts

Signature _____

Date 4/24/2018

J. CENTRAL CONTROLLED AUTOMATIC IRRIGATION SYSTEM

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J. CENTRAL CONTROLLED AUTOMATIC IRRIGATION SYSTEM

PART 1 GENERAL

1.01 Description

This section is to be used in conjunction with the IRRIGATION section. The Landscape Architect/Irrigation Designer and the Contractor shall reference both sections in the course of designing and constructing projects. This section only provides supplemental information specific to those areas that are required to install a central controlled automatic irrigation controller.

The following information is specific to the design and installation of a HydroPoint Data Systems, Inc. WeatherTRAK ETPro3 cloud based automatic irrigation system. All model numbers are in reference to WaterSavers Irrigation part numbers (typical).

1.02 Definition of Contractor

The term Contractor is used in its broadest sense within this section. The Contractor may be a Developer/Contractor installing public improvements to be turned over to the County for maintenance, the County General Services Department, or Construction Contractors hired on contract by the County.

1.03 Scope of Work

A. The Landscape Architect/Irrigation Designer shall consult with WaterSavers Irrigation and the County to determine specific model information prior to submitting the Landscape Plans for review. The number and locations of all satellite assemblies shall be indicated on the Landscape Plans.

B. The Contractor shall organize and conduct a pre-construction meeting with a representative from WaterSavers Irrigation, the Landscape Architect/Irrigation Designer, and the County.

C. All central controlled irrigation system controller components, except interconnect conductors, shall have a ten year limited warranty provided by the equipment supplier. It is the responsibility of the Contractor to coordinate with the equipment supplier to inspect the components after installation and obtain warranty certification. The Contractor shall then submit proof of warranty to the County prior to project acceptance and the start of the maintenance period. No installation will be accepted by the County without proof of warranty.

D. All existing and new computerized control system components shown on the Reviewed Landscape Plans shall be fully operational prior to Final acceptance.

E. All incidental parts which are not indicated on the Reviewed Landscape Plans, specified herein, or in the rest of the County Landscape Standards, and are necessary to complete or modify the existing system shall be furnished and installed by the Contractor, at the Contractor's expense. The system shall be in satisfactory operating condition at the time of project completion.

F. If work is to be done on an existing system, the Contractor shall maintain the system in effective operating condition for the duration of the project. The Contractor must notify the County at least five working days prior to undertaking any work on a County maintained system.

G. The Contractor shall coordinate with HydroPoint Data Systems for Central Internet Management (CIM) service for the controller locations shown on the reviewed landscape plans. Minor changes caused by actual site conditions shall be made at no cost to the County. All necessary changes must be approved by the County and noted on the as-built plans.

H. Related work specified elsewhere.

1. Refer to the IRRIGATION section.
2. Refer to the PLANTING section.
3. Refer to the SUBMITTAL REQUIREMENTS section.
4. Refer to the LONG TERM MAINTENANCE section.

1.04 Quality Control

A. CODES AND STANDARDS

All work and materials shall be in full compliance with codes and standards, including, but not limited to:

1. The rules and regulations of the National Electric Code

2. The rules and regulations of the Uniform Plumbing Code, as published by the Western Plumbing Officials Association

3. All applicable State and local laws, codes, and regulations

4. Model Water Efficient Landscape Ordinance (MWELO), State of California

The above-mentioned codes and standards are the minimum level requirements.

J. CENTRAL CONTROLLED AUTOMATIC IRRIGATION SYSTEM

Nothing in the Reviewed Landscape Plans is to be construed to permit work not conforming to these codes and standards. If the Reviewed Landscape Plans call for materials or construction of a better quality or larger size than required by the above mentioned rules and regulations, the provision in the Reviewed Landscape Plans shall take precedence. The Contractor is responsible for complying with all applicable rules and regulations, including those not mentioned here or shown on the Reviewed Landscape Plans. All materials and labor required for compliance shall be furnished by the Contractor, at no additional cost to the County.

B. SAFETY

1. All work shall be performed in a safe manner and shall meet or exceed the safety standards established under the Federal Occupational Health and Safety Act (OSHA) and its most current amendments.

2. Barricades, guards, warning signs, and lights shall be erected and maintained as required by OSHA regulations, the Property Owner, or by the County for the protection of the public and workers

C. PERSONNEL

1. The Contractor shall possess all proper and current licenses, certificates, permits and/or registrations required to perform the scope of services.

2. The Contractor shall employ at least one qualified supervisor familiar with the products and requirements of this section. The supervisor shall be present at the project at all times and his or her name shall be submitted to the County before beginning work. The supervisor shall be English speaking and shall have full authority to act on behalf of the Contractor

3. The Contractor shall employ workers familiar with the products and requirements of this section

D. SITE PROTECTION

1. The Contractor shall incur all expenses to repair or replace any damage to existing improvements, such as buildings, equipment, irrigation systems, piping, sewers sidewalks, or landscaping caused during activities related to the scope of work in this section. Repairs and replacements must be done in a manner and to a quality level satisfactory to the Owner and County within a reasonable timeframe as determined by the County.

2. The Contractor shall exercise extreme care when excavating and working near existing utilities. The Contractor is responsible for correcting any damage to existing utilities for which the Contractor's operation is either the direct or indirect cause. The Contractor is required to call Underground Service Alert (USA) at (800) 227-2600 or 811 for marking of underground utilities prior to excavating.

PART 2 MATERIALS

All materials furnished and installed shall be new and shall conform to the Contra Costa County Public Works Department Landscape Standards and installation shall be done in accordance to the Reviewed Landscape Plans.

2.01 Flow Sensor Conduit

All central controlled system flow sensor conduit and fittings shall be 1-inch Schedule 40 PVC, unless otherwise noted.

2.02 Flow Sensor Conductor

A. The flow sensor cable required from the flow sensor to the controller assembly enclosure shall be a two conductor shielded cable. The flow sensor cable may be used to connect the flow sensor to a WeatherTRAK controller up to a maximum distance of 2,000 feet apart. The cable shall be installed in a 1-inch Schedule 40 PVC conduit.

B. All conductors shall be of the same type and size as that shown on the Reviewed Landscape Plans and necessary for proper system operation.

2.03 Wire Splices

A. Conductors shall be installed with no underground splices unless absolutely necessary and unavoidable and may only be done after receiving prior County approval. All underground splices shall be placed in a Carson model 1419 valve box and heat stamped "CONDUCTOR WIRE SPLICE", and follow all other IRRIGATION section requirements for valve boxes.

B. Wire splices on the flow sensor cables shall be made with a 3M DBY splice kit

2.04 Pull Boxes

Pull boxes shall be fabricated from a durable plastic material resistant to weather, sunlight, and chemical reaction with soil. Pull boxes shall be a minimum size of 20 inches in length, 15.25 inches

in width and 12 inches in height. In paved areas, the pull box shall be a concrete type with a cast iron lid traffic rated

2.05 Electrical Ground Rod

A 5/8-inch by 8-foot long electrical ground rod, clamp, and #10 wire shall be provided in every satellite assembly. It shall be installed within the enclosure, through the concrete and shall not extend above the surface of the concrete more than 8 inches. The electrical ground rod is provided as part of a Watersavers Irrigation pre-assembled controller assembly.

2.06 Controller Assembly

A. All Controller assemblies shall be pre-assembled by Watersavers Irrigation in a top entry (SA6 series) or metered (SA5 series) "Strongbox" stainless steel weatherproof, vandal resistant, lockable enclosure manufactured by VIT Products. The controller components are available from Watersavers Irrigation.

B. The controller assembly shall consist of a stainless steel enclosure, stainless steel removal backboard, interconnect terminal strips, primary power voltage surge arrester, on/off switch, a ground fault interrupt circuit, electrical ground rod, wire, and clamp.

    1. The controller assembly (where applicable) shall include a flow sensing assembly with normally open master valve assembly option (part # WTF3-XXX-PD-NO, where XXX equals mainline size, example 150,200,300,400 or 600) for each point of connection (maximum of two per controller/group) or a Dual Flow Sensing Assembly with Master Valves option for a single point of connection with a bypass to monitor very low and high flow rates.

C. The controller assembly shall be covered by a five year limited warranty provided by Watersavers Irrigation. The contractor shall provide an additional five year warranty.

PART 3 EXECUTION

3.01 Flow Sensor Conduit

A. The flow sensor conduit shall be located within the public right-of-way whenever possible. If the conduit is installed outside of the public right-of-way, an easement shall be provided to the County prior to installation.

B. Conduit runs shall be installed as indicated on the Reviewed Landscape Plans. Any changes shall be approved by the County prior to installation.

C. The ends of the conduits shall be reamed to remove burrs and rough edges. Cuts shall be made square and true.

D. The ends of the conduit shall be capped until the pulling of wiring is started.

E. Conduit bends, except factory bends, shall have radii of not less than six times the inside diameter of the conduit.

F. Conduit shall be installed at a depth not less than 18 inches below finished grade.

G. Conduit shall be free of soil and debris.

H. A nylon or polypropylene pull rope with a minimum tensile strength of 500 pounds shall be installed in all conduits which are to receive future interconnect cable. At least 2 feet of pull rope shall be extended beyond each end of the conduit run and secured.

3.02 Flow Sensor Conductors

A. All flow sensor conductors shall be pulled by hand.

B. A total of 3 feet of cable shall be left at each controller assembly and pull box. Sufficient slack shall be left to allow the wire to extend 18 inches above the top of the pull box grade.

C. All flow sensor cable shall be continuous from flow sensor to controller. All splices shall occur within the controller assembly enclosure unless specifically authorized otherwise by the County.

3.03 Wire Splices

A. Conductors shall be installed with no underground splices unless absolutely necessary and unavoidable and may only be done after receiving prior County approval. All underground splices shall be placed in a Carson model 1419 valve box and heat stamped "CONDUCTOR WIRE SPLICE", and follow all other IRRIGATION section requirements for valve boxes.

B. Wire splices on the communication or flow sensor cables shall be made with 3M DBR/Y – 6 Splice splice kit.

C. Splices shall be done in a manner to allow satisfactory operation while continuously

submersed in the water.

3.04 Pull Boxes

Pull boxes shall be installed in accordance to the manufacturer's directions.

3.05 Electrical Ground Rod

A. A 5/8-inch by 8-foot long electrical ground rod, clamp, and #10 wire shall be provided at every controller location. It shall be installed within the enclosure, through the concrete, and shall not extend above the surface of the concrete more than 8 inches.

B. All central controlled irrigation system equipment shall be grounded to conform to the requirements of the manufacturer, the National Electric Code, and all other applicable laws, codes, and ordinances.

C. No solder connections will be allowed.

D. Ground resistance shall not exceed 75 ohms.

3.06 Controller Assembly

All Controller assemblies shall be pre-assembled by Watersavers Irrigation. The Contractor shall install the controller assembly at the site in strict accordance with Watersavers Irrigation guidelines and as indicated on the Reviewed Landscape Plans. After installation, the Contractor shall contact Watersavers Irrigation for inspection and warranty certification.

3.07 Warranty

A. All central controlled irrigation system controller components, , shall have a five-year limited warranty provided by the equipment supplier. It shall also have a five year extended warranty provided by the contractor for a total of ten years. It is the responsibility of the Contractor to coordinate with the equipment supplier to inspect the components after installation and obtain warranty certification. The Contractor shall then submit proof of warranty to the County prior to project acceptance and the start of the maintenance period. No installation will be accepted by the County without proof of warranty.

B. For those areas to be maintained by the County, the Contractor shall provide the County with a signed guarantee for the landscape irrigation system prior to the County accepting the project. The warranty requires the Contractor to make any

necessary corrections to the landscape irrigation system, at the Contractors expense, for a period of one year from the date of acceptance by the County. The Contractor shall make corrections within 10 days of notification by the County.

C. The Contractor shall guarantee all materials, equipment, and workmanship to be free of defects and to fill and repair all depressions due to the settlement of trenched areas and to repair or replace any lawn, plants, or other improvements disturbed by the problem or during repairs. Ordinary wear and tear, unusual abuse, or neglect is exempted.

D. Refer to the Irrigation Warranty Detail for more information.

PART 4 WATERSAVERS IRRIGATION SUPPORT

Watersavers Irrigation offers the following support for the design and installation of those areas required to install a WeatherTRAK ET Pro 3 and WeatherTRAK ET Pro3 controlled automatic irrigation systems:

A. Provide consultation over the phone for both design and installation issues.

B. Conduct one pre-construction meeting on site with the Landscape Architect/Irrigation Designer, the Contractor, and the County.

C. Hook-up flow sensor cables inside the assembly.

D. Test and verify proper electrical grounding.

E. Field test for proper operation of the controller components.

F. Conduct flow sensing cable continuity and resistance testing.

G. Conduct calibration of controller assembly flow sensing components.

H. Verify that the equipment conforms to and is installed in accordance with Watersavers Irrigation specifications and recommendations.

I. Perform functional testing of central controlled automatic irrigation system from a computer, smart phone and tablet.

J. Provide written warranty certification that is to be provided to the County prior to formal acceptance of the project and the start of the maintenance period.

J. CENTRAL CONTROLLED AUTOMATIC IRRIGATION SYSTEM

END OF SECTION

Approved by Special Districts

Signature _____

Date 4/24/2018

K. PLANTING

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K. PLANTING

PART 1 GENERAL

1.01 Definition of Contractor

The term Contractor is used in its broadest sense within this section. The Contractor may be a Developer/Contractor installing public improvements to be turned over to the County for maintenance, the County General Services Department, or Construction Contractors hired on contract by the County.

1.02 Scope of Work

A. The Contractor shall furnish and install all trees, shrubs, vines, perennials, annuals, groundcover, and perform related work thereto including:

1. Installing root barriers and water barriers.
2. Placing mulch in landscape areas.

B. The work shall include the provision of all labor, materials, equipment and apparatus not specifically mentioned herein or noted on the Reviewed Landscape Plans, but which are incidental and necessary to complete the work specified.

C. Related work specified elsewhere:

1. Refer to SOIL PREPARATION Section
2. Refer to IRRIGATION Section
3. Refer to CENTRAL CONTROLLED AUTOMATIC IRRIGATION SYSTEMS Section
4. Refer to PLANT ESTABLISHMENT MAINTENANCE Section

1.03 Quality Control

A. CODES AND STANDARDS

1. All construction shall comply with any applicable standards and current Federal, State and County codes and ordinances including:

a. AASHTO-American Association of State Highway and Transportation Officials

b. State of California (Caltrans) Standards -Standard Specifications, Section 20-4, Highway Planting

c. ANSI Z60.1 An Annotated Checklist of Woody Ornamental plants of California, Oregon, & Washington

K. PLANTING

B. SAFETY

1. All work shall be performed in a safe manner and shall meet or exceed the safety standards established under the Federal Occupational Health and Safety Act and its most current amendments.

2. Barricades, guards, warning signs, and lights shall be erected and maintained as required by OSHA regulations, the Property Owner, or by the County for the protection of the public and workers.

C. PERSONNEL

1. The Contractor shall possess all proper and current licenses, certificates, permits and/or registrations required to perform the scope of services.

2. The Contractor shall employ at least one qualified supervisor familiar with the products and requirements of this section. The supervisor shall be present at the project at all times and his or her name shall be submitted to the County before beginning work. The supervisor shall be English speaking and shall have full authority to act on behalf of the Contractor.

3. The Contractor shall employ workers familiar with the products and requirements of this section.

D. SITE PROTECTION

1. The Contractor shall incur all expenses to repair or replace any damage to existing improvements, such as buildings, equipment, irrigation systems, piping, sewers sidewalks, or landscaping caused during activities related to the scope of work in this section. Repairs and replacements must be done in a manner and to a quality level satisfactory to the Owner and County within a reasonable timeframe as determined by the County.

2. The Contractor shall protect all existing vegetation that is to remain.

   a. The Contractor shall protect existing mature specimen trees a minimum of 50% beyond the dripline. The term tree dripline shall mean the widest distance to the edge of canopy extending equally around the tree circumference. Refer to the PLANTING DETAILS section.

   b. Grade changes outside the dripline shall be such that drainage water of any type or source is not diverted toward or around the root crown in any manner. The grade shall drain away from root crown at a minimum of 2% slope.

3. The Contractor shall exercise extreme care when excavating and working near existing utilities. The Contractor is responsible for correcting any damage to existing utilities for which the Contractor's operation is either the direct or indirect cause. The Contractor is required to call Underground Service Alert (USA) at (800) 227-2600 for marking of underground utilities prior to excavating.

E. REVIEWS AND INSPECTIONS

The Contractor shall specifically request the following County reviews at the appropriate times and prior to progressing with work. The County will decide at the time of the request if the specific inspection will be required.

1. Finish Grade Inspection

   The County shall conduct the finish grade inspection after the topsoil and amendments have been incorporated. The finish grade inspection is always required.

2. Plant Material and Layout Inspection

   a. Upon delivery of plant materials, the County will review trees, shrubs, groundcover plantings, and/or selected sod rolls for species type and general health. The plants to be reviewed shall be set out in their containers or arranged in such a way as to allow access to all sides of each plant.

   b. At the time when the locations of all trees and shrubs (5 gallon size or larger) are flagged in the planting areas, the County will review the plant locations for required clearances to utilities and structures, for intersection line-of-sight criteria established by AASHTO, and for conformance with the Reviewed Landscape Plans.

3. Substantial Completion Inspection

   a. This site visit is to be scheduled upon completion of all work and will review the entire site for conformance to the Reviewed Landscape Plans and these standards. The Contractor shall submit irrigation and planting As-Built plans at this inspection for on-site review. A punch list documenting any deficiencies or items not in conformance will be distributed to the Developer/Contractor.

   b. A follow-up site visit will be conducted to verify that punch list items, or any other deficiencies that have occurred between inspections, have been corrected. If deficiencies remain, additional inspections will be required until all deficiencies are rectified. A punch list documenting any items not in conformance will be provided to the Developer/Contractor.

   c. The date the work passes the Substantial Completion Inspection shall be the start

date of the required maintenance period, known as the Plant Establishment Period. In order to pass the Substantial Completion Inspection, the site must be per plan with the irrigation system functioning properly and all plant materials must be in a healthy, thriving condition. The County will provide written confirmation that the work has passed the Substantial Completion Inspection. This inspection is always required.

4. Pre-Final Inspection

   This site visit is to be scheduled approximately 30 calendar days prior to the end of the required maintenance period. Any deficiencies will be noted in a punch list and distributed to the Developer/Contractor. The purpose of this inspection is to provide ample time for the Developer/Contractor to correct any deficiencies prior to the end of the required maintenance period and the Final Acceptance Inspection.

5. Final Acceptance Inspection

   a. This site visit is to be scheduled 5 working days prior to the end of the plant establishment maintenance period and following completion of all punch list items. It will verify that the project is complete and establish the date of final acceptance and assumption of maintenance by the County.

   b. All As-built plans, pest control and fertilizer application summaries, keys, manuals, in addition to the materials/submittals detailed in the IRRIGATION SECTION, shall be delivered prior to the final acceptance inspection, preferably at the start of the inspection.

   c. At this time all plant materials must be in a thriving, healthy and established condition, regardless of whether specifically noted on any punch list. Should it be determined that any deficiencies remain, the County will terminate any further review of the site until all items are guaranteed, in writing, by the Developer/Contractor to be complete. If any plant materials are replaced, they must also become established and be in a healthy thriving condition, prior to scheduling a reinspection. This inspection is always required.

   d. The date the work passes the Final Acceptance Inspection shall be the start date of the required warranty period. However, if the work was installed as part of a Subdivision/Landscape Agreement, the start date of the required warranty period shall be the date of the Board Order in which the County Board of Supervisors declares the improvements as complete.

6. Warranty Inspection

   a. This site visit is to be scheduled at the end of the required warranty period. The Developer/Contractor will be liable to make any necessary repairs or

modifications of deficiencies resulting from faulty design, installation, labor, or materials. The Developer/Contractor will not be held liable for deficiencies resulting from improper maintenance actions, or neglect by the County.

b. The Developer/Contractor is not fully released from the work until the Warranty Inspection is passed. If the work was installed as part of a Subdivision/Landscape Agreement, release of the bonds will occur after the date of the Board Order in which the County Board of Supervisors declares the end of the warranty period for the improvements.

1.04 Submittals

A. The Contractor shall submit to the County all required government plant inspection certificates.

B. The Contractor shall submit to the County proof of required government permits for the use of insecticides, herbicides, and other pesticides along with a list of proposed products and application.

C. The Contractor shall submit to the County a schedule showing dates for accomplishing the work. The Contractor shall include estimated dates when approvals by the County will be needed.

D. Within five days after award of the contract, the Contractor shall submit notice to the County certifying:

1. The quantity and species of plant materials ordered.

2. The nursery supplying the materials and any plant material unavailable at the time (with the nursery's proposed schedule for delivery or growing the material or a proposal regarding use of the nearest size and variety).

E. If plant materials are certified by the Contractor and then not available at the time of installation, the Contractor shall upsize with available plant material at no additional cost to the County.

F. The Contractor shall submit a sample of the cedar shred mulch for approval by County.

G. If turf is specified, the Contractor shall submit the seed mixture for the proposed sod. The County must approve the seed mixture before sod is ordered.

H. If turf block is shown on the Reviewed Landscape Plans, the Contractor shall submit manufacturer information for the proposed turf block product to the County for approval.

1.05 Storage

A. The Contractor shall provide healthy growing conditions for all plants that are stored on the site before installation.

B. The Contractor shall water, fertilize, and protect plants from excessive wind, sun, or shade while they are in storage.

C. The Contractor shall store all materials where they are protected from damage including weather and vandalism.

D. The Contractor shall stop work if air temperature, soil moisture, or climate conditions are beyond limits established by standard practice. Under no circumstances shall any planting be performed if the temperature exceeds 90° F or is below 40° F. No planting shall be done when the soil is saturated with water.

PART 2 MATERIALS

2.01 Nomenclature and Labels

A. Plant botanical names shall conform to "Standardized Plant Names," second edition, and secondly, "A Checklist of Woody Ornamental Plants of California," Manual 32, University of California.

B. All plants of each clone, species and cultivar shall be delivered to the site labeled with their full botanical names.

C. Every plant species shall be labeled with no less than one label for every ten plants of a species.

2.02 Quality

The minimum quality of all plant materials shall conform to the prevailing published specifications of the California Association of Nurserymen and the American Association of Nurserymen, "American Standard for Nursery Stock." Additional specifications shall be indicated in the Reviewed Landscape Plans.

2.03 Quantities

The quantities shown on the plant list and in labels are for the County's use and are not to be construed as the complete and accurate limits of the contract. The Contractor shall furnish and install all plants shown schematically on the drawings of the Reviewed Landscape Plans.

2.04 Root Systems and Root Barriers

A. All container-grown stock shall be grown in its container for at least six months prior to planting.

B. The Contractor shall allow one percent of the quantity of plants for removal and inspection.

C. Any plant material, within one year following the final acceptance of the project, determined by the County to be defective, restricted declining, or otherwise deficient due to abnormal root growth, shall be replaced by Contractor, to the equal condition of adjacent plants, at the time of replacement.

D. Root barriers shall be provided for all trees within 5 feet of any hard surfacing material such as sidewalks curbs and gutters, buildings and decorative paving.

E. The root barrier shall be fabricated from a high density and high impact plastic such as polyvinyl chloride (PVC), acrylonitrile-butadiene-styrene (ABS) polystyrene, polypropylene, or polyethylene, and shall have a minimum thickness of 0.06 inches.

F. The barrier shall have 1/2-inch to 3/4-inch raised vertical ribs on the inner surface spaced not more than 8 inches apart to discourage circling roots. If segmented panels are used, each panel shall be permanently interlocked to the adjacent panels to form a continuous linear or cylindrical barrier.

G. Where a tree is located within 5 feet of hardscape such as walk or curb, the root barrier shall be installed in a linear fashion, along length of the hardscape, rather than wrapped around rootball. See ROOT BARRIER detail.

H. The County encourages the use of products that contain post-consumer recycled plastic.

2.05 Trees

A. All trees shall have straight trunks of uniform taper, larger at the bottom.

B. Street trees shall be 24-inch box type.

C. Trunks shall be free of damaged bark, with all minor abrasions and cuts showing healing tissue.

D. Sucker basal growth and sucker lateral growth shall be removed and treated to eliminate re-sprouting.

E. Normal lower side branching shall remain.

F. Trees unable to stand upright without support shall be rejected. Staking shall only be used to straighten a tree, not fully support it.

2.06 Health

A. Foliage roots and stems of all plants shall be of vigorous health and normal habit of growth for its species.

B. All plants shall be free of all diseases, stages of insects, bums, or disfiguring characteristics.

2.07 Mulch and Cobble

A. Mulch used may be cedar shred mulch. Mulch shall be a mixture of shredded bark and wood, and shall have a particle size between 1/8 inch and 1/2 inch in thickness and 1 inch to 8 inches in length. At least 75 percent, by volume, of the material shall conform to the sizes specified.

B. Mulch shall be free of salt and foreign materials such as clods, coarse objects sticks, rocks, weeds, and weed seeds. Keep mulch 5 to 6 inches away from tree trunks.

C. Where such products are appropriate and available and, subject to County approval, the County encourages the use of recycled mulch or chipped bark. When using compost, the Contractor shall provide certification that manufacturing procedures involve temperatures and detention times that effectively inactivate weed seeds and other deleterious organisms or materials.

D. Cobble for tree wells or swales, if indicated on the Reviewed Landscape Plans, shall be well-rounded river run stone with a generally consistent color and shape. This size of each cobble shall vary from between 4 inches and 6 inches in diameter. Each cobble shall be clean and free of foreign material when placed. In most instances, a fabric layer shall be placed under the cobble.

PART 3 EXECUTION

3.01 Protection of Plants

A. The Contractor shall maintain all plant materials in a healthy growing condition prior to and during planting operations.

B. The Contractor shall be responsible for vandalism, theft, and damage to plant materials until the end of the maintenance period.

3.02 Root Systems

A. The Contractor shall be responsible for inspection of all root systems on plant materials. Inspection shall include, but not be limited to, checking for rootbound stock, encircling roots at the perimeter of the container, girdling roots at the top surface of the rootball, and other defective root conditions.

B. Such inspections shall include the complete removal of soil from one percent of plant material containers or at least one plant from each nursery and each plant type.

C. The Contractor shall cut defective or potentially defective girdling, rootbound, and encircling roots and spread the root system into the surrounding backfill.

D. The Contractor shall reject plants with excessively defective root systems.

3.03 Pruning

A. The Contractor shall do no pruning without the specific approval of the County.

B. The Contractor shall replace plants pruned without approval, if required by the County.

C. All pruning shall be undertaken in accordance with the specifications set out in the TREE PRESERVATION AND PRUNING Section.

3.04 Basins

A. The Contractor shall construct basins as necessary to water plants.

B. The Contractor shall remove basins from all plants under a permanent irrigation system prior to final inspection and finish grade the planting area.

C. Basin bottoms shall drain to berms away from the plant stem.

3.05 Staking

A. All trees shall be staked as indicated in the Reviewed Landscape Plans and in the DETAILS section with stakes driven securely into existing soil, aligned with the trunk, and perpendicular to the direction of the prevailing winds.

B. A minimum of two figure-eight tree ties is required per stake as indicated in the

Reviewed Landscape Plans and in the DETAILS section.

3.06 Tree and Plant Pits

A. Tree pits shall have their sides and bottoms loosened or otherwise broken to prevent glazed or compacted surfaces. The Contractor shall auger for each tree a minimum of three 18-inch diameter holes as appropriate for trees size and as indicated in the planting notes and details of the Reviewed Landscape Plans.

B. Plant pits shall have their sides and bottoms loosened or otherwise broken to prevent glazed or compacted surfaces, and shall be as indicated in the planting notes and details of the Reviewed Landscape Plans.

3.07 Backfill

A. Excavated material shall be spread onto adjacent areas as replacement.

B. Only unamended soil shall be used beneath the rootball and the bottom of plant pit shall be cultivated to improve porosity.

C. Should additional backfill be necessary, a mixture of one-third organic amendment/fertilizer mix as indicated in the laboratory report and two-thirds topsoil may be used.

3.08 Plant Tablets

A. All container plants shall receive plant tablets as follows:

1. One-gallon plants:	two 21-gram tablets
2. Five-gallon plants:	five 21-gram tablets
3. Fifteen-gallon plants:	ten 21-gram tablets
4. Box trees:	eighteen 21-gram tablets

B. Tablets shall be spaced evenly around the rootball, halfway up the backfill and touching the side of the rootball. The County may require excavation of plants selected at random for a conformance review.

C. Additional fertilizer shall be applied as required per recommendations of soil analysis.

3.09 Pesticides

A. The Contractor shall verify compatibility, dosage, and other application procedures with a licensed pest control operator and with the manufacturer and shall pre-test any and all chemicals at the site to verify total compatibility with proposed plantings. The Contractor

shall be responsible for any damages arising from inappropriate use.

B. All employees using chemicals shall be trained in the proper use of these chemicals and shall be licensed or certified as required by state and local agencies.

C. APPLICATION

1. Herbicide: Treat all planting areas 20 days after planting as required to obtain weed control.

2. Anti-desiccant: Apply one or more applications of anti-desiccant to plants immediately after arrival to the site and thereafter as required to minimize wind damage to plants.

3.10 Mulch

A. Unless otherwise specified on the Reviewed Landscape Plans, all landscaped areas excluding turf areas, shall have a 3-inch layer of mulch placed atop the finish grade, except in plant basins and groundcover planted from flats or liners.

B. Plant basins and groundcover areas planted from flats or liners shall have 2 inches of mulch placed atop the finish grade.

3.11 Turf

A. All hydroseeding shall be completed before September 15th for optimum germination period.

B. Any turf areas to be re-seeded after September 15th shall include pre-germinated seed or sod as approved by the County.

3.12 Palms

A. All palms require fronds to be removed prior to transporting to appropriately balance the loss of roots expected during excavation. A minimum number of fronds shall be removed to achieve this balance while at the same time appropriately protecting the apical growing bud of the palm. The tops of any remaining fronds shall not be cut off.

B. All palms shall be skinned prior to shipment to the job site.

C. All palm fronds shall be tied in an upright position with untreated 2-ply twine, which shall be tied horizontally across the palm fronds tightly enough to remain during transportation and installation. Fronds shall remain tied during installation procedures and shall be allowed to open as twine deteriorates.

D. The width of planting pits for palm trees shall be a minimum of 2 feet greater than any side of the rootball, or a minimum of 88 inches wide. Depth shall be 2 feet greater than the depth of the rootball and a minimum of 60 inches deep, or larger depending on the actual size of the rootball.

E. Finished grade shall drain a minimum of 2 percent away from trunk.

F. Palms shall be planted with trunks at original grade and shall be backfilled entirely with a sand backfill soil which has been analyzed by an approved soil testing laboratory. The sand should be 0.25 -0.50 millimeters minimum in particle size (200 inches per hour infiltration after compaction). This backfill shall be applied in layers, tamped, and thoroughly settled with water to eliminate air pockets.

G. The base and sides of planting pit shall be scarified before palm installation to minimize hostile interface and facilitate rooting.

H. Irrigation shall be installed per tree detail and irrigation plans.

I. PVC drain lines shall be per tree detail and irrigation and drainage plans.

J. Trees shall be installed perpendicular to grade and plumbed under the direction of the landscape architect.

K. Any adjustments necessary to straighten palms due to settling or shifting shall be made by the Contractor at no charge.

L. Deep irrigations shall be applied immediately to all palms. After this deep application, soil moisture levels and base frequency of irrigation applications on actual evapo-transpiration rates for the site shall be monitored.

M. Palms shall be installed only during the season of active root growth, corresponding to the period between March 1st and August 31st planting at other times of the year greatly increases the possibility of disease infection and decline.

3.13 Cleanup

A. After completion of all operations, the Contractor shall remove all trash, excess soil and other debris.

B. All walks and pavement shall be swept and washed clean, leaving the entire area in a neat, orderly condition.

3.14 Guarantee and Replacement

K. PLANTING

A. During the guarantee period (12 months from final acceptance of the total project by the County), the Contractor/Landscape Architect shall assess any plant material that is dead or not in vigorous, healthy growing condition.

B. The Contractor shall either replace the plant material in-kind, or if it is determined that the species will not thrive in the area the Contractor/Landscape Architect will request a revision of the Reviewed Landscape Plans and resubmit to the County for approval. The Contractor shall then replant as necessary. Replacements shall be done at no cost to the County.

C. The Contractor shall not be held liable for loss of plant materials during the guarantee period due to vandalism or accidental causes.

D. The first day of the guarantee period shall be the date of the letter informing the Contractor that the County has accepted project maintenance.

END OF SECTION

Approved by Special Districts

Signature _____

Date December 1, 2014